

# Preface

One of the key problems in modern embedded systems design is the productivity gap. While the performance of computing architectures has been rapidly increasing in the past few decades, design tools have not kept pace. As a result, it is becoming increasingly difficult for embedded systems designers to handle complex applications. Delays in product delivery and even project cancellations are quite common. An obvious solution is to raise the abstraction level of design tools and at the same time enable automatic synthesis from high level specifications. A complete embedded application needs to be specified in a single system level language rather than using programming languages and hardware description languages to create an early non-optimal hardware/software partition. From a single system specification written in a formal language, it is possible to automate design space exploration, hardware/software partitioning, verification and synthesis, which gives an enormous boost to design productivity. However, all these design activities can be automated by design tools only if the system-level specification is constructed according to a formal model of computation, which sets the rules for communication among concurrent processes comprising the system. While several models of computation have been successfully used in certain classes of applications, their applicability in complex embedded system design is quite limited. In particular, there is a lack of suitable models for heterogeneous embedded systems that contain both control-driven and data-driven behaviours.

This book offers a new design methodology for design of heterogeneous embedded systems. At the heart of the methodology lies a model of computation called DFCharts. A complete design flow is covered, from a system specification in a formal language to an implementation on a multiprocessor architecture. Throughout the book examples are provided to illustrate main concepts. The reader is not required to have a deep understanding of models of computation. Only basic familiarity is assumed. For this reason, following the introductory Chaps. 1 and 2

describes a number of widely used models of computation and system level languages. Chaps. 3–8 then present the DFCharts based design methodology. The conclusion with future research directions follow in Chap. 9.

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